DISCUSSION OF THE CLAIMS

Claims 1-8 and 10-27 are pending in the present application. Claim 16 is amended to correct the typographical error. Claims 26-28 are new claims. Support for new Claims 27 and 28 is found in Tables 1-3 of the original specification. Support for new independent Claim 26 is found in previously presented Claim 1 and the examples. The original disclosure describes an electron-transporting material of an electron-transporting layer is having an ionization potential of from 5.4 eV to 6.0 eV. The Examples of the original specification describe a family of materials within the 5.6-6.0 eV ionization potential range. The original disclosure therefore describes a genus of electron-transporting materials that includes those having an ionization potential of from 5.6 to less than 5.9 eV.

No new matter is believed to have been added by this amendment.

REMARKS

Claim 1 is drawn to organic electroluminescent device having an emitting layer and an electron-transport layer. The electron-transport layer has the particular hole mobility properties recited in Claim 1. The Office rejected Claim 1 as obvious over Tsuboyama I (JP 2002-343572) in view of Mishima (U.S. 2002/0096995); Nii (U.S. 6,693,295); and Tsuboyama II (U.S. 6,783,873). The Office concedes that Tsuboyama I does not disclose an electron-transporting material having the hole mobility characteristics recited in Claim 1 (see the last full sentence on page 3 of the October 27 Office Action). To cure this deficiency the Office turns to Mishima and asserts the following with respect to the hole mobility properties of the Mishima materials and the presently claimed composition:

> ... it is the position of the Examiner that one of ordinary skill in the art would be motivated to produce an electron-transporting material with a hole mobility greater than $10^{-5}cm^2/(V{\cdot}s)$ from the disclosure of Mishima et al. The motivation is clearly provided by the fact that having high hole mobilities would facilitate efficient hole-transfer to the cathode leading to improved device performance.

See the paragraph bridging pages 4 and 5 of the October 27 Office Action.

Applicants point out that the Office's assertions with respect to the hole mobility properties of the cited art are unsupported by any evidence of record. Inspection of the Mishima reference shows no disclosure or description of the hole mobility of a prior art material nor is there any disclosure that high hole mobility facilitates efficient hole-transfer to a cathode to thereby improve device performance.

Applicants submit that the Office's assertion with respect to the presence and/or function of hole mobility in the Mishima disclosure lacks factual support. The Office therefore failed to show that at least one of the features of the presently claimed invention; namely, the hole mobility property of the electron-transporting material, is disclosed and/or

suggested by the cited art. The rejection of the claims, as set forth in the October 27 Office Action, is thus not legally supportable and should be withdrawn.

Further, Mishima describes the function of the electron-transporting layer as follows:

> The electron-transporting layer contains at least an electron-transporting material and, if necessary, properly selected components such as a polymer binder. As the electron-transporting material, any of those which exert either the function of transporting electrons and the function of blocking holes injected from the anode may be used with no limitations.

See paragraph [0059] of Mishima.

Mishima describes the function of an electron-transporting layer to include *blocking* holes rather than facilitating hole-transfer.

During a discussion with the Examiner and the Examiner's supervisor on March 29, 2011 the Examiner appeared to argue that paragraph [0065] of Mishima is evidence that high hole mobility is a desirable property in an electron transporting material. In fact, paragraph [0065] discloses only that an electron transporting material can "confine" holes:

> Ionization potential of the electron-transporting material is preferably 5.9 eV or higher, more preferably 6.0 eV or higher, still more preferably 6.2 eV or higher. Electron-transporting materials having such ionization potential can **confine** holes within the light-emitting layer, which is advantageous in that holes and electrons injected from the electron-transporting layer can effectively be recombined to generate excitons, thus a high luminance and a high light-emitting efficiency being obtained. Ionization potential of the electron-transporting material can be measured by any method, for example, by means of a UV photo-electron analyzer AC-1 (made by Riken Keiki K. K.) in the atmosphere.

Moreover, as explained above, paragraph [0059] makes it clear that the function of the electron transporting material is to *block* holes.

Applicants draw the Office's attention to new independent Claim 26 and new dependent Claims 27 and 28. The new claims describe an electron transporting material having ionization potential properties different from those of the cited art. Mishima discloses that the "ionization potential of the electron-transporting material is preferably 5.9 eV or

higher, more preferably 6.0 eV or higher, still more preferably 6.2 eV or higher." There is no overlap between the ionization potentials of Claims 26-28 and the ionization potentials described in paragraph [0059] of Mishima.

Applicants thus submit that the new claims are further patentable over the art of record.

Further during the March 29 discussion, the Examiner appeared to urge that the disclosure of high ionization potential in paragraph [0065] of Mishima is suggestive of high hole mobility in the electron transporting material. Applicants submit that it is known in the art that hole mobility is not directly related to ionization potential. Applicants submit the following definitions and information to show that it is known in the art that hole mobility and ionization potential are not directly related.

(i) "Ionization potential": Amount of energy per a unit charge required to remove an electron to infinity from a given species of an atom or molecule. Usually it is expressed by a unit of volt (V) (see partial English translation of "McGraw-Hill Dictionary of Scientific and Technical Terms," by The Nikkan Kogyo Shimbun, LTD., March 20, 1979, page 57).

(ii) "Mobility": Easiness of particle motion in cases of unregulated motion, and motion under the influence of electric field or external force (see partial English translation of "McGraw-Hill Dictionary of Scientific and Technical Terms," by The Nikkan Kogyo Shimbun, LTD., March 20, 1979, page 75).

As understood from (i) and (ii), "ionization potential" is an amount of energy required to completely remove an electron from an atom or a molecule to form an ion corresponding to the molecule. "Hole mobility" on the other hand is a factor of velocity obtained by measuring the time necessary for holes to move from a certain point to another point in a predetermined electric field. Ionization potential and hole mobility are properties which are used differently when designing a device.

(iii) Applicants submit that those of skill in the art readily recognize that mobility if affected by conditions other than ionization potential. For example, mobility is known to be affected by temperature, molecular density and the like (see Extract of "Physics of Semiconductor Devices", Section "1.5 Carrier Transport Phenomena, pages 27-30).

(iv) As further evidence that hole mobility does not directly relate to ionization potential, Applicants provide the following information obtained from "Device Physics, Material Chemistry, and Device Application of Organic Light Emitting Diodes," Chihaya Adachi, CMC Publishing Co., Ltd., December 14, 2007.

Compound	Hole mobility $[cm^2/(V \cdot s)]$ [eV]	Ionization potential
α-NPD	0.0022	5.44
TPT-1	0.0078	5.44
TPD	0.0012	5.5

The compounds α-NPD and TPT-1 have almost the same ionization potential but TPT-1 has nearly 4 times as large a hole mobility as α-NPD. On the other hand, TPD which has an ionization potential higher than of α-NPD and TPT-1, has conversely one-half or one sixth the hole mobility as α-NPD and TPT-1. This factual information further shows that ionization potential and hole mobility do not directly correlate.

For the reasons discussed above in detail, Applicants request withdrawal of the rejection and the allowance of all now-pending claims.

Respectfully submitted,

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